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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/588,008	06/06/2000	Sam Yang	M4065.0210/P210	9015
24998	7590	04/03/2006	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP			TRINH, HOA B	
2101 L Street, NW			ART UNIT	
Washington, DC 20037			PAPER NUMBER	
			2814	

DATE MAILED: 04/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

11A

**Office Action Summary**

Application No.

09/588,008

Applicant(s)

YANG ET AL.

Examiner

Vikki H. Trinh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-31 and 99 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-31, 99 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/04/05 has been entered.

### *Claim Objections*

1. Claims 21-22 are objected to because of the following informalities: in line 3 of claim 21 and line 4 of claim 22, a comma “,” should be inserted **before** the term “and”, **not after** the term “and”. Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3, 7-16, 18-25, 29-31, and 99 are rejected under 35 U.S.C. 102(e) as being anticipated by Iizuka (6,338,996).

With respect to claims 1 and 99, Iizuka discloses a capacitor in a semiconductor device having a bottom conducting layer 28 (fig. 1), wherein the bottom conducting layer 28 forms a

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bottom electrode (col. 3, lines 35-40); an annealed dielectric layer 30 (fig. 1) over the bottom conducting layer 28, wherein the annealed dielectric layer is annealed with a first annealing process (col. 1, lines 30-35; col. 2, lines 13-15; col. 4, lines 55-60); and a top electrode 32 (fig. 1) that consists of a single top conducting layer (fig. 1) over the dielectric layer 30; wherein the annealed top layer is annealed with a second annealing process (col. 2, line 33; col. 5, lines 20-25) layer. Note that “oxidizing gas anneal” is an anneal performed in a gas mixture with oxygen concentration. Note also that the present application invention selects the set of device claims. This means that the patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

As to claim 2, Iizuka discloses that the bottom conducting layer 28 (fig. 1) is formed of a material selected from the noble metal group (col. 3, lines 38-40).

As to claim 3, Iizuka discloses that the bottom conducting layer is formed of a metal (col. 3, lines 38-40).

As to claims 7-8, Iizuka discloses that the bottom conducting layer is formed from material such as platinum (Pt) and Ruthenium (Ru). (col. 3, lines 38-40).

As to claim 9, Iizuka discloses that the capacitor is formed over a conductive plug 18 (fig. 1) or 21 (fig. 2b), and further includes depositing an oxygen barrier 24 or 26 (fig. 1) over the plug 18 or 21 (fig. 1 or fig. 2b) prior to forming the bottom conducting layer 28 (fig. 1).

As to claim 10, Iizuka discloses that the dielectric layer is a dielectric metal oxide layer (col. 3, lines 40-42).

As to claim 11, Iizuka discloses that the dielectric layer has a high dielectric constant that falls within the range as claimed. (e.g. BST, Col. 3, lines 40-42).

As to claims 12-13, Iizuka discloses that the dielectric layer 30 (fig. 1) is formed of a material such as BST. (Col. 3, lines 40-42).

As to claim 14, Iizuka teaches that the dielectric layer 30 (fig. 1) is heated to a temperature above 200 degrees Celsius (col. 4, lines 59-60) to change it to a crystallized dielectric layer 30 from an original material that may be an amorphous material (col. 4, lines 55-63, col. 1, lines 30-33).

As to claim 15, Iizuka discloses that the top conducting layer 32 (fig. 1) is formed of a material selected from the noble metal group (col. 3, lines 38-40).

As to claim 16, Iizuka discloses that the top conducting layer 32 is formed of a non-oxidizing metal permeable to oxygen (col. 3, lines 38-40).

As to claims 18-19, 22, Iizuka discloses that the top conducting layer 32 (fig. 1) is formed from material such as platinum (Pt) and Ruthenium (Ru). (col. 3, lines 38-40).

As to claims 20-21, Iizuka discloses that the top and bottom conducting layers 32, 28 (fig. 1) are formed of a material such as platinum (col. 3, lines 38-40) and the dielectric layer 30 (fig. 1) is a BST (col. 3, lines 40-42).

As to claim 23-25, Iizuka discloses that the top conducting layer 32 is annealed with a gas mixture having oxygen compound (col. 5, lines 20-25).

As to claim 29, Iizuka teaches the capacitor is a stacked capacitor (fig. 1).

As to claim 30, the capacitor (fig. 1) further comprises an access transistor (fig. 1) connected to the capacitor (fig. 1).

As to claim 31, the capacitor may be a DRAM (fig. 1).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 4-5 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iizuka, as applied to claim 32, in view of Emesh et al. (5,452,178) (hereinafter Emesh).

Iizuka discloses the invention substantially as claimed. However, Iizuka does not explicitly state that the bottom conducting layer may be formed of a metal alloy or conducting metal oxide, and that the top conducting layer is formed of a conducting metal oxide.

Emesh discloses an analogous method and device having a bottom electrode 54 (fig. 3), a dielectric 60, 64 (fig. 3), and a top electrode 68 (fig. 3), wherein the bottom electrode 54 (fig. 3) may be formed of conductive metal alloy, or conductive metal oxide (col. 7, lines 1-2). The top electrode 68 may be formed of conducting metal oxide (col. 9, lines 40-42).

Therefore, as to claims 4-5, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the bottom electrode of Iizuka with the metal alloy or conductive metal oxide material, as taught by Emesh, so as to provide an alternative material to make the bottom electrode.

As to claim 17, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Iizuka with the top electrode made of conductive metal oxide, as taught by Emesh, so as to provide an alternative material to make the top electrode.

6. Claims 6, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iizuka, as applied to claim 32, in view of Alers (6,303,426).

Iizuka discloses the invention substantially as claimed. In particular, Iizuka discloses that the top conducting layer 32 (fig. 1) is formed of platinum (Pt). However, Iizuka does not explicitly state that the bottom conducting layer may be formed of a metal nitride and the dielectric layer may be formed of a Tantalum oxide (TaO) and is crystalline or amorphous material.

Alers discloses an analogous method and device having a bottom electrode 66 (fig. 3), a dielectric layer 70 (fig. 3), and a top electrode 80 (fig. 3), wherein the bottom electrode 66 is made of metal nitride material (col. 3, lines 53-54) and the dielectric layer 70 is formed of Tantalum Oxide (TaO) and is either crystalline or amorphous (col. 3, lines 58-65).

Therefore, as to claim 6, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Iizuka with the bottom electrode

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made of metal nitride, as taught by Alers, so as to provide an alternative material for the bottom electrode.

As to claim 14, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Iizuka with the dielectric layer made of Tantalum oxide (TaO), as taught by Alers, so as to provide an alternative material for the dielectric layer.

7. Claims 26-27 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Iizuka, as applied to claim 32, in view of Narwankar et al. (6,475,854) (hereinafter Narwankar).

Iizuka discloses the invention substantially as claimed. However, Iizuka does not explicitly disclose that the annealing step is a plasma enhanced annealing, a remote plasma enhanced annealing, or ultraviolet light enhanced annealing.

Narwankar discloses an analogous method and device having a bottom electrode 604 (fig. 6f), a dielectric layer 606 (fig. 1), and a top electrode 610 (fig. 6f), wherein the top electrode 610 is annealed (col. 11, line 4-5) in an oxygen environment, thereby performing an oxidizing annealing step. The annealing is a plasma enhanced annealing, or remote plasma enhanced annealing (col. 13, lines 14-20) and that the annealing is done at a pressure of 2.5 Torr and performed at 2 minutes (col. 13, lines 10-15).

Therefore, as to claims 26-27, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Iizuka with the annealing such as plasma enhanced annealing, or remote plasma enhanced annealing, as taught by Narwankar, so as to provide an alternative technique to anneal the top electrode.



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Note: The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

8. Claim 28 is rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Iizuka, as applied to claim 32, in view of Marsh (6,387,802).

Iizuka discloses the invention substantially as claimed. In particular, Iizuka discloses the top electrode 32 made of platinum (Pt) (col. 3, lines 38-39). However, Iizuka does not explicitly teach that the annealing step of the top electrode is an ultraviolet light enhanced annealing.

Marsh discloses an analogous method and device having a bottom electrode 152 (fig. 11), a dielectric layer 153 (fig. 11), and a top electrode (col. 8, lines 30-35), wherein the top electrode is deposited and annealed (col. 2, lines 30-35) using ultraviolet light enhanced annealing in the same manner as the bottom electrode.

Therefore, as to claim 28, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the annealing step of Iizuka with ultraviolet light enhanced annealing, as taught by Marsh, so as to provide an alternative technique to anneal the top electrode and to remove carbon in the platinum group metal of the top electrode (col. 2, lines 34-35).

Note: The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

### ***Response to Arguments***

9. Applicant's arguments with respect to the pending claims have been considered but are not persuasive.

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In the Remarks, applicants argue that Iizuka does not teach annealing a dielectric layer with a first annealing process and annealing the top conducting layer with a second annealing process. On the contrary, Iizuka does teach each and every limitation of the claims. In particular, Iizuka teaches a first annealing process performed on the dielectric layer so that the dielectric layer is crystallized. The second annealing process is performed after the top conducting layer is formed so as to recover from any defects to the device. As stated in the above rejection, Iizuka discloses the annealed dielectric layer annealed with a first annealing process (col. 1, lines 30-35; col. 2, lines 13-15; col. 4, lines 55-60); and the annealed top layer is annealed with a second annealing process (col. 2, line 33; col. 5, lines 20-25) layer. Therefore, the rejection of claims 1-3, 7-16, 18-25, 29-31, and 99 under 35 U.S.C. 102(e) as being anticipated by Iizuka is proper.

Similarly, the rejection of claims 4-5 and 17 under 35 USC 103(a) as being unpatentable over Iizuka in view of Emesh is maintained, because Iizuka teaches a first annealing process and a second annealing process, as stated in the above. Furthermore, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Iizuka and Emesh are in the same field of endeavors. Thus, Emesh cures the deficiency in Iizuka.

Another, the rejection of claims 6 and 14 under 35 USC 103 (a) as being unpatentable over Iizuka in view of Alers is maintained, because Iizuka teaches a first annealing process and a second annealing process, as stated in the above. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Iizuka and Alers are in the same field of endeavors. Thus, Alers cures the deficiency in Iizuka.

Another, the rejection of claims 26-27 under 35 USC 103 (a) as being unpatentable over Iizuka in view of Narwankar is maintained, because Iizuka teaches a first annealing process and a second annealing process, as stated in the above. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Iizuka and Narwankar are in the same field of endeavors. Thus, Narwankar cures the deficiency in Iizuka.

Another, the rejection of claims 28 under 35 USC 103 (a) as being unpatentable over Iizuka in view of Marsh is maintained, because Iizuka teaches a first annealing process and a

second annealing process, as stated in the above. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Iizuka and Marsh are in the same field of endeavors. Thus, Marsh cures the deficiency in Iizuka.

The argument with respect to claim 99 being rejected under 35 USC 103(a) as being unpatentable over Iizuka in view of Emesh is moot in view of the new rejection.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Vikki Trinh whose telephone number is (571) 272-1719. The Examiner can normally be reached from Monday-Friday, 9:00 AM - 5:30 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Wael Fahmy, can be reached at (571) 272-1705. The office fax number is 703-872-9306.

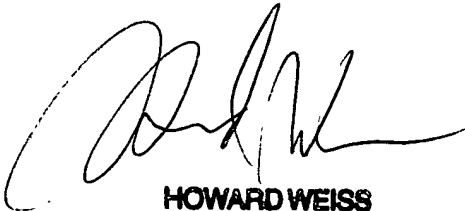
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pertaining to the Private PAIR system, please contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

Lastly, paper copies of cited U.S. patents and U.S. patent application publications will cease to be mailed to applicants with Office actions as of June 2004. Paper copies of foreign patents and non-patent literature will continue to be included with office actions. These cited U.S. patents and patent application publications are available for download via the Office's PAIR. As an alternate source, all U.S. patents and patent application publications are available on the USPTO web site ([www.uspto.gov](http://www.uspto.gov)), from the Office of Public Records and from commercial sources. Applicants are referred to the Electronic Business Center (EBC) at <http://www.uspto.gov/ebc/index.html> or 1-866-217-9197 for information on this policy. Requests to restart a period for response due to a missing U.S. patent or patent application publications will not be granted.

Vikki Trinh,  
Patent Examiner  
AU 2814



**HOWARD WEISS**  
**PRIMARY EXAMINER**